Jurnal Keterapian Fisik
Vol. 8, No. 1, May 2023
https://doi.org/10.37341/jkf.v8i1.493

Original Research

The Difference in the Effect of Progressive Muscle Relaxation and Elderly Exercise on Blood Pressure Reduction in Elderly Hypertensive Patients

Angling Krismaya Jati[1*], Budi Utomo[2], Sukadarwanto Sukadarwanto[3]

[1,2,3] Departement of Physiotherapy, Poltekkes Kemenkes Surakarta, Indonesia

ABSTRACT

Background: *Hypertension in the elderly isolated systolic hypertension (ISH), where increased systolic pressure increases the likelihood of stroke and myocardial infarction even if diastolic pressure is within normal limits. The purpose of this study was to determine the difference in the effect of progressive muscle relaxation and elderly exercise on blood pressure reduction in elderly hypertensive patients.*

Methods: *This study used a two-group pre-test and post-test design involving 20 subjects randomly divided into two groups. Group I was given progressive muscle relaxation treatment, and group II was given elderly exercise treatment. The frequency of exercise was twice a week for two weeks. The measuring instrument used in this study was a sphygmomanometer.*

Results: *Hypothesis I test using a paired sample t-test obtained a p-value of 0.001, while hypothesis II test using a paired sample t-test obtained a p-value of <0.001. Hypothesis III test using an independent sample t-test obtained a p-value of 0.042 (p<0.005).*

Conclusion: *Progressive muscle relaxation combined with exercise for the elderly has an effect on lowering blood pressure in elderly people with hypertension. Both interventions can be used to lower blood pressure in the elderly.*

ARTICLE HISTORY
Received: November 24th, 2025
Accepted: December 2nd, 2025

KEYWORDS
elderly exercise, hypertension, progressive muscle relaxation;

CONTACT
Angling Krismaya Jati
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anglingkrismayajati@gmail.com
Departement of Physiotherapy, Poltekkes Kemenkes Surakarta. Jl. Kapten Adi Sumarmo, Tohudan, Colomadu, Karanganyar Regency, Central Java, Indonesia.

Cite this as: The Difference in the Effect of Progressive Muscle Relaxation and Elderly Exercise on Blood Pressure Reduction in Elderly Hypertensive Patients. (2023). *Jurnal Keterapian Fisik*, *8*(1), 54-60. https://jurnalketerapianfisik.com/index.php/jpt/article/view/493

INTRODUCTION

The aging process is a natural stage experienced by every individual as they enter old age. The elderly undergo various physiological, psychological, and social changes that can reduce their ability to adapt to their environment. Physical changes such as decreased muscle strength, stamina, and blood vessel elasticity increase the risk of degenerative diseases, including hypertension (Djamhari et al., 2020). This condition often affects the independence of the elderly in performing daily activities and can reduce their quality of life. Therefore, efforts to maintain blood pressure stability and body function balance are important in maintaining fitness in old age.

Globally, the elderly population continues to increase along with life expectancy. World Health Organization data shows that by 2050, the proportion of elderly people in the world will reach more than 25% of the total population. In Indonesia, the number of elderly people increased from 27.5 million in 2019 to an estimated 57 million in 2045 (Putri, 2021). This increase in the number of elderly people will have an impact on the increasing prevalence of degenerative diseases, especially hypertension, which is the leading cause of premature death in the world (Musa, 2021). This condition emphasizes the need for effective preventive and rehabilitative strategies to control blood pressure in the elderly.

Hypertension is one of the non-communicable diseases that remains a major health problem in Indonesia. This disease often does not cause symptoms, but can lead to serious complications such as stroke, heart failure, and chronic kidney disease (Kuswardhani, 2017). In the elderly, hypertension often takes the form of isolated systolic hypertension due to a decrease in the elasticity of the arteries. Studies show that elderly individuals with high blood pressure have a greater risk of mobility impairment and disability (Yunding et al., 2021). Therefore, non-pharmacological interventions such as physical exercise and relaxation are important alternatives for maintaining blood pressure within normal limits without dependence on medication.

One intervention that has been proven effective in lowering blood pressure is progressive muscle relaxation exercises. This exercise is performed by tensing and relaxing specific muscle groups to reduce overall body tension, thereby helping to lower blood pressure and increase comfort (Dongoran et al., 2022). Research conducted by Damanik and Ziraluo, (2018) showed a significant decrease in blood pressure after the application of progressive muscle relaxation in hypertensive patients. In addition, exercise for the elderly is also a form of light physical activity that has been proven to help lower blood pressure by improving blood circulation and blood vessel elasticity (Rangkuti & Ramadhini, 2020; Rasiman & Ansyah, 2020).

Both interventions, progressive muscle relaxation and elderly exercise, focus on blood pressure control but have different mechanisms of action. Progressive muscle relaxation emphasizes control of the autonomic nervous system through stress reduction, while exercise for the elderly focuses on improving heart fitness and blood circulation (Sianipar & Putri, 2018). However, there have not been many studies that directly compare the effectiveness of these two interventions on lowering blood pressure in elderly people with hypertension. Based on this, this study aims to determine the difference in the effects of progressive muscle relaxation and elderly exercise on blood pressure reduction in elderly hypertensive individuals.

MATERIALS AND METHOD

This study used an experimental design with a randomized pre- and post-test two-group design. This design was chosen because it allows for a comparison of the effectiveness of two different interventions on the same dependent variable, thereby providing more objective results. Two treatment groups were formed randomly, with the first group receiving progressive muscle relaxation training and the second group receiving elderly exercise. Before and after the intervention, blood pressure was measured using a sphygmomanometer to assess the changes that occurred. The design was appropriate because it allowed researchers to observe the differences in the effects of the intervention on blood pressure reduction directly.

The study was conducted at the Tohudan Elderly Health Center, Surakarta, Central Java, during January 2023, with exercises conducted twice a week for two weeks. The population in this study consisted of all elderly people who participated in the posyandu activities and met the research criteria. Sample selection used purposive sampling, based on the researcher's consideration of the characteristics of subjects that met the research criteria. The sample size of 20 elderly people met the minimum requirements for a small experimental study with two balanced treatment groups.

The inclusion criteria in this study included elderly people aged 60–70 years, suffering from hypertension with blood pressure >140 mmHg, able to walk without assistance from others, able to understand instructions well, and willing to participate in the entire research series by signing an informed consent form. Exclusion criteria included elderly individuals with severe physical disorders, inability to communicate, use of mobility aids, and those who did not participate in the intervention more than three times or withdrew during the study. The researchers ensured that all participants understood the research procedures to guarantee ethical and safe involvement.

The independent variables in this study were progressive muscle relaxation and elderly gymnastics, while the dependent variable was a decrease in blood pressure. The control variable was advanced age. The instruments used included a calibrated sphygmomanometer to measure blood pressure and an observation sheet to record the measurement results. Validity and reliability tests were conducted by ensuring that the measuring instruments were in standard condition and used by the same operator to minimize inter-observer bias. The use of valid and reliable measuring instruments ensured the accuracy of blood pressure measurements before and after the intervention.

The data collection procedure consisted of three stages, namely the preparation stage, intervention implementation, and evaluation. In the preparation stage, the researchers obtained research permission from the Physiotherapy Department of the Surakarta Ministry of Health Polytechnic and selected subjects based on inclusion criteria. The implementation stage included providing interventions according to the treatment group, with a frequency of twice a week for two weeks. Blood pressure measurements were taken at the beginning of the study (pre-test) and after the intervention period was completed (post-test). The evaluation stage was carried out by comparing blood pressure measurement results between times and between groups to determine the effectiveness of each intervention.

Data analysis was performed using SPSS version 26 with several statistical tests as needed. The normality test used the Shapiro-Wilk test, the homogeneity test used Levene's test, and hypothesis testing was performed with a paired t-test for paired data and an unpaired t-test for comparisons between groups. This study was deemed ethically sound because it had obtained permission from the Physiotherapy Department of the Surakarta Ministry of Health Polytechnic and was conducted in accordance with research ethics principles, such as respecting the rights of participants, maintaining data confidentiality, and minimizing risks to research subjects.

RESULTS

Table 1. Characteristics of Respondents Based on Age and Body Mass Index (n = 20 elderly individuals)

Characteristics	Category	Group I Progressive Muscle Relaxation (n, %)	Group II Elderly Exercise (n, %)
Age (years)	60–65	9 (90)	8 (80)
	66–70	1 (10)	2 (20)

Characteristics	Category	Group I Progressive Muscle Relaxation (n, %)	Group II Elderly Exercise (n, %)
BMI (kg/m²)	25–29.9 (Overweight)	3 (30)	3 (30)
	>30 (Obese)	7 (70)	7 (70)

Table 1. Shows that most respondents were aged 60–65 years (85%) and were classified as obese (70%). This indicates that the majority of elderly people are at high risk of hypertension due to age and excess weight. The balanced distribution of characteristics between groups indicates good homogeneity for testing the effectiveness of the intervention.

Table 2. Mean Blood Pressure Values Before and After Intervention (n = 20 Elderly Individuals)

Group	Blood Pressure	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	p-value*	Description
Progressive Muscle Relaxation	Systolic	146.8 ± 5.0	139.3 ± 6.2	<0.001	There is a significant difference
	Diastolic	100.7 ± 7.3	90.5 ± 7.6	<0.001	There is a significant difference
Senior Gymnastics	Systolic	149.6 ± 6.4	133.6 ± 5.4	<0.001	There is a significant difference
	Diastolic	95.3 ± 7.0	82.4 ± 5.8	<0.001	There is a significant difference

*Paired t-test

Table 2 shows that both interventions—progressive muscle relaxation and geriatric exercise—effectively reduced systolic and diastolic blood pressure with *a p-value < 0.05*. A greater reduction in blood pressure occurred in the geriatric exercise group, indicating higher effectiveness in stabilizing blood pressure in hypertensive elderly individuals.

Table 3. Comparison of Mean Blood Pressure Differences Between Groups (n = 20 Elderly Individuals)

Blood Pressure	Group I (Relaxation)	Group II (Exercise for the Elderly)	Difference Mean	p-value
Systolic	7.3	16.0	8.7	0.042
Diastolic	10.2	12.9	2.7	0.016

Table 3. The results of the *independent sample t-test* analysis show a significant difference between the two groups ($p < 0.05$). The difference in systolic and diastolic blood pressure averages is greater in the elderly exercise group, so it can be concluded

that elderly exercise has a more effective influence in lowering blood pressure than progressive muscle relaxation.

DISCUSSION

The results showed that most respondents were aged between 60 and 65 years and were classified as obese based on their Body Mass Index (BMI). Advanced age and obesity are important risk factors for hypertension because they are associated with decreased blood vessel elasticity and increased peripheral resistance. With increasing age, endothelial function declines, reducing the ability of blood vessels to relax, causing blood pressure to rise (Mafaza & Adriani, 2016). This condition indicates that age and excess weight need to be considered in planning hypertension prevention interventions for the elderly.

This study also found that progressive muscle relaxation exercises have an effect on lowering blood pressure in elderly hypertensive individuals. These results are in line with the study by Anggraini et al., (2022) which states that regular progressive muscle relaxation exercises can lower systolic and diastolic blood pressure in the elderly. This exercise works by systematically tensing and relaxing the muscles of the body, which then activates the parasympathetic nervous system and suppresses sympathetic nerve activity. This response results in vasodilation of blood vessels and a decrease in heart rate, thereby stabilizing blood pressure (Dongoran et al., 2022). In addition, relaxed muscles also reduce the secretion of stress hormones such as ACTH and CRH, which play a role in increasing blood pressure.

In the group that did senior gymnastics, the results of the study also showed a significant decrease in blood pressure. These results are in line with the study by Tina et al., (2021), which showed that regular senior gymnastics for two weeks effectively lowered blood pressure in hypertensive seniors. Senior exercise improves blood circulation, blood vessel elasticity, and heart fitness, thereby stabilizing blood pressure (Rangkuti & Ramadhini, 2020). In addition, rhythmic physical activity also helps increase the body's metabolism and improves the balance between the sympathetic and parasympathetic nervous systems (Yunding et al., 2021). This indicates that light exercise such as elderly exercise can be used as a safe and effective non-pharmacological therapy for blood pressure control in the elderly.

The results of the comparison between the two interventions show that senior gymnastics is more effective than progressive muscle relaxation in lowering blood pressure. This is in line with the research by Oktafiandanu & Fatmawati, (2018) which found that a combination of progressive muscle relaxation and senior gymnastics resulted in a more significant reduction in blood pressure than when done separately. The effectiveness of elderly exercise can be explained by increased peripheral blood flow and cardiac adaptation to physical activity, which improves cardiac efficiency. In addition, elderly exercise also involves coordination of breathing and body movements that can help the nervous system relax naturally, thereby providing a more comprehensive physiological impact.

In terms of clinical implications, the results of this study confirm that both progressive muscle relaxation and geriatric exercise can be used as effective and safe physiotherapy exercises for elderly people with hypertension. This intervention can be implemented routinely in health centers, hospitals, and elderly communities because the procedure is simple, does not require special equipment, and can be done independently after receiving initial guidance from health workers. The exercise program can also be a

promotive-preventive strategy in controlling hypertension without dependence on medication. Continuous implementation is expected to improve the quality of life and independence of the elderly.

However, this study has several methodological limitations. The relatively small sample size (20 people) and short intervention period may affect the generalizability of the study results. Additionally, the researchers could not control activities outside the study, such as diet, stress, and antihypertensive medication use, which may have affected blood pressure measurements. For future research, it is recommended to involve a larger sample size, extend the intervention duration, and control for external factors that may influence measurement results.

CONCLUSION

This study shows that both progressive muscle relaxation and exercise for the elderly have an effect on lowering blood pressure in hypertensive elderly people, but exercise for the elderly has been proven to be more effective. Regular physical exercise can increase blood vessel elasticity, reduce sympathetic nerve activity, and improve heart function, thereby stabilizing blood pressure. The results of this study indicate that senior gymnastics can be used as an effective, inexpensive, and easy-to-implement non-pharmacological intervention in blood pressure control efforts in the elderly. It is recommended that health workers and senior health center managers integrate senior gymnastics and relaxation exercises into their routine activities.

ACKNOWLEDGEMENTS

The author would like to thank the Director of Poltekkes Kemenkes Surakarta, along with the staff of the Physiotherapy Department at Poltekkes Kemenkes Surakarta.

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